

2D Elastic Practice Problem and Lab Notes 2.10.12 Honors Physics

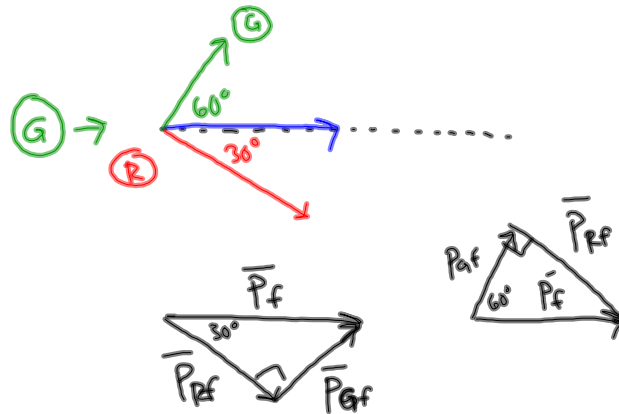
Green ball $\rightarrow m_G = 10 \text{ kg}$, $\vec{v}_{Gi} = 20 \text{ m/s}$ to the east

Red ball $\rightarrow m_R = 12 \text{ kg}$, $\vec{v}_{Ri} = 0 \text{ m/s}$

After collision, green moves at 60° N of E.

Red moves at 30° S of E.

Find final velocities of both.



$$\vec{P}_i = \vec{P}_f$$

$$\begin{aligned}\vec{P}_f &= \vec{P}_i = \vec{P}_{Gi} + \vec{P}_{Ri} \\ &= m_G \vec{v}_{Gi} \\ &= 200 \text{ kg}\cdot\text{m/s}\end{aligned}$$

$$\cos(30^\circ) = \frac{P_{Rf}}{P_f}$$

$$\begin{aligned}P_{Rf} &= P_f \cos(30^\circ) \\ &= 173.2 \text{ kg}\cdot\text{m/s}\end{aligned}$$

$$P_{Rf} = m_R v_{Rf}$$

$$v_{Rf} = \frac{P_{Rf}}{m_R} = 14.4 \text{ m/s}$$

$$\sin(30^\circ) = \frac{P_{Gf}}{P_f}$$

$$P_{Gf} = 100 \text{ kg}\cdot\text{m/s}$$

$$P_{Gf} = m_G v_{Gf}$$

$$v_{Gf} = 10 \text{ m/s}$$

TEST WEDNESDAY

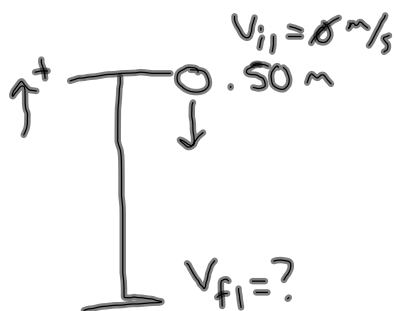
- Impulse-Momentum thm.
- Conservation of Momentum
 - 1D elastic/inelastic
 - 2D elastic/inelastic

Golf Ball Impulse Lab

Goal \rightarrow find force on golf ball

$$\bar{F} \Delta t = m \Delta \bar{v}$$

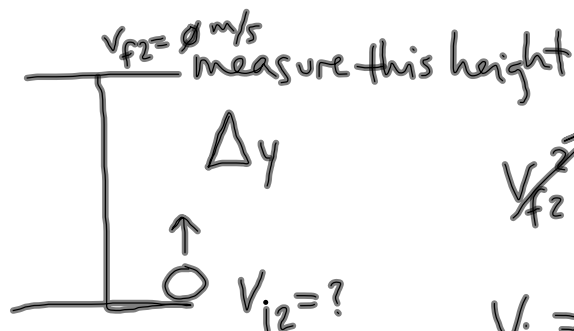
$$m = 0.050 \text{ kg} \quad \bar{F} = \frac{m(\bar{v}_{f1} - \bar{v}_{i2})}{\Delta t}$$



$$v_{f1}^2 = v_{i1}^2 + 2a_g \Delta y$$

$$v_{f1} = \pm \sqrt{2a_g \Delta y}$$

Diagram showing a golf ball hitting a surface. The initial velocity v_{i2} is upward, and the final velocity v_{f1} is downward. The impulse equation is shown as $\bar{F} = \frac{m(\bar{v}_f - \bar{v}_i)}{\Delta t}$.



$$v_{f2}^2 = v_{i2}^2 + 2a_g \Delta y$$

$$v_{i2} = \pm \sqrt{-2a_g \Delta y}$$